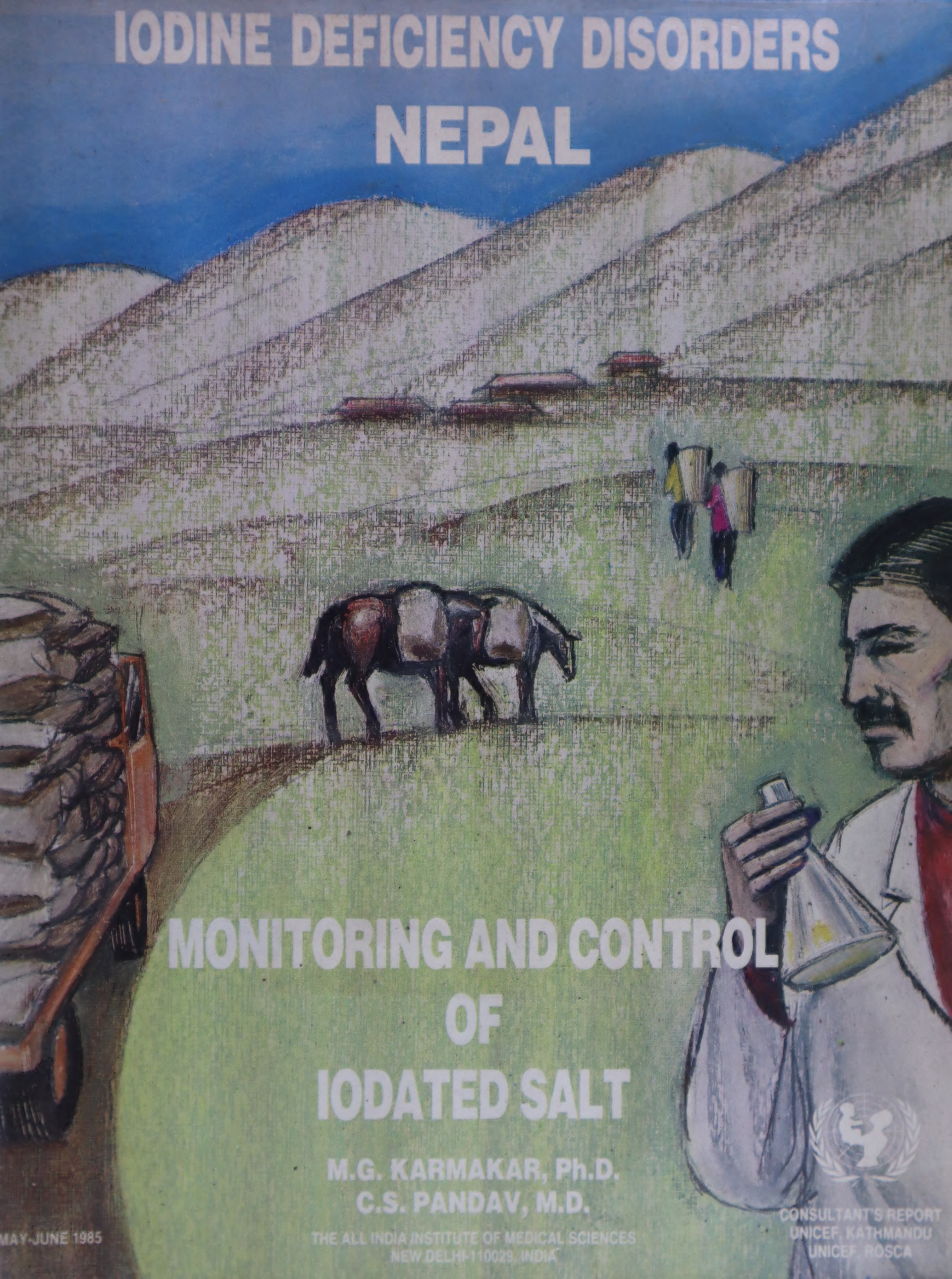
# IODINE DEFICIENCY DISORDERS

# NEPAL



# MONITORING AND CONTROL OF IODATED SALT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MAY-JUNE 1985

CONSULTANT'S REPORT
UNICEF, KATHMANDU
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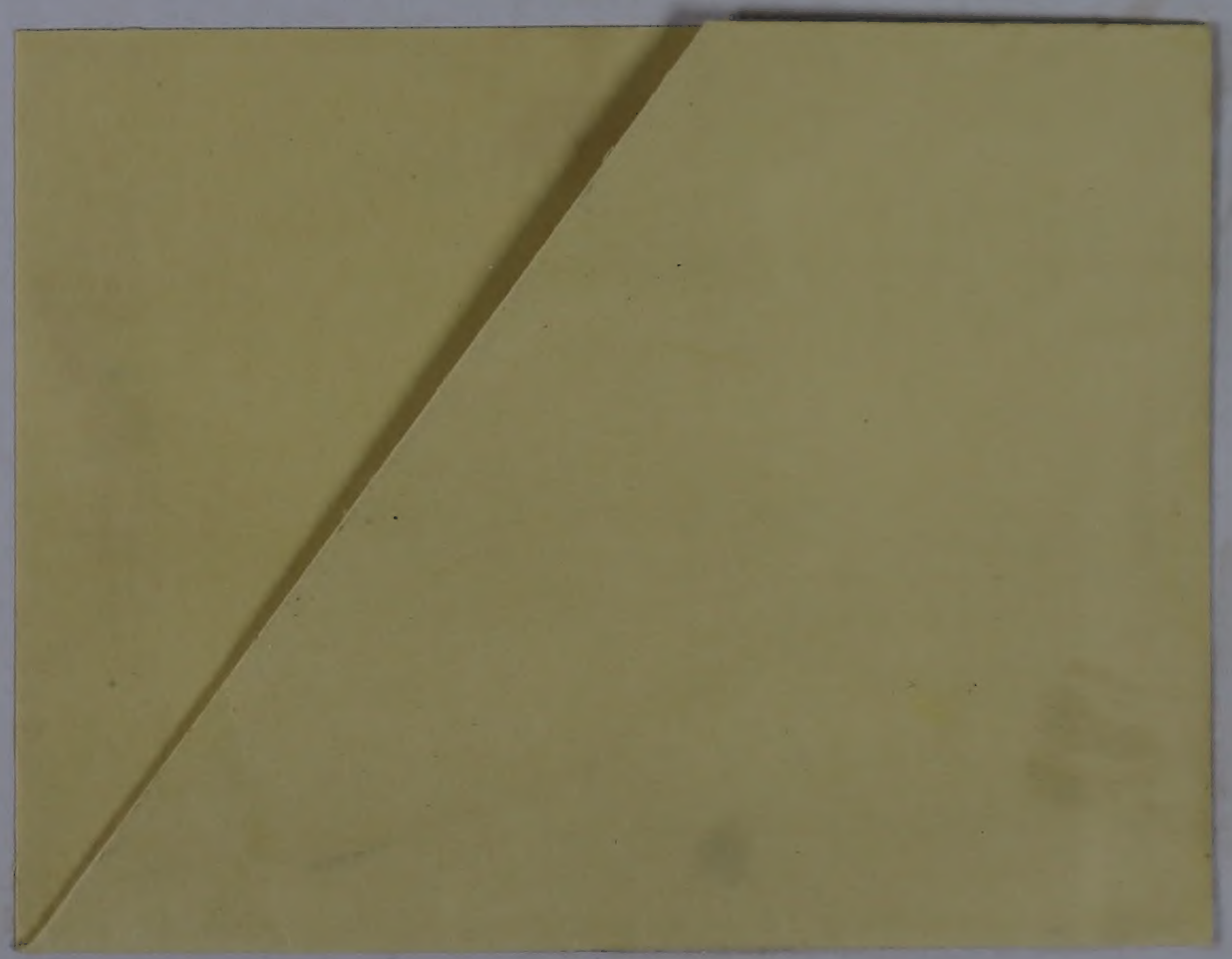

# IODINE DEFICIENCY DISORDERS IN NEPAL

# MONITORING AND QUALITY CONTROL OF IODATED SALT

A REPORT

BY

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## CONTENTS

## EXECUTIVE SUMMARY

(i) Supplementation of iodine in salt is a quantitative measure and the minimum quantity which must be available at consumer level is 150 mg of iodine per person per day/

(ii) A successful salt iodation programme depends on a chain of events. Every link of the chain has to be strong and sound.

(iii) A good quality common salt makes salt iodation economic and effective. If the salt arrives in the form of big crystals, it has to be crushed for better iodination.

(iv) A vigilant laboratory at the salt iodation plants is mandatory for estimating and regulating the iodine content at source.

(v) Packaging iodated salt in LDPE lined jute bags or adopting appropriate polythelene family pack though apparently may add to the expenses is in point of fact an economic way to prevent loss of iodine. This would decrease the level of iodination at source and considerably save expensive iodine which has to be imported.

(vi) Stencilling and labelling the date of salt iodation, the iodine content at source in PPM and batch number are pre-requisites for giving information on iodine retention at different stages of distribution, transportation and storage chain.

(vii) Instructions on proper storage of iodated salt in SYC godowns, wholesale and retail outlets and at consumer level need to be circulated and widely publicized.

(viii) Salt samples need to be collected from salt iodation plants, STC godowns, wholesalers, retailers and consumers at regular intervals and analysed. A continuous feedback system with all the programme implementing and monitoring agencies needs to be established.

(ix) A network of iodine a monitoring laboratories at each of the salt iodation plants and district level needs to be established.

(x) It is necessary to have Central Iodine Monitoring laboratories that would conduct training courses for laboratory personnel and provide reagents to the other iodine monitoring laboratories.

(xi) The consumers, retailers, wholesale traders and the staff of all agencies and departments concerned with IDD should be educated on IDD.

(xii) Since the Goitre and Cretinism Eradication Project and Salt Trading Corporation are working towards the same objective, that of eradication of IDD a common logo should be developed and popularised with the assistance of appropriate health education media.

## 1. INTRODUCTION

Iodine is an essential micro-nutrient. The normal requirement of iodine for human beings averages 150 ug per person per day. About 90 percent of this quantity comes from food, while the rest comes from water. Food crops and water derive iodine from the soil. Some soils contain more iodine than others. Soils which are poor in iodine content are common in mountainous regions, adjoining plains and river basins where iodine is periodically washed away by heavy rainfall and repeated flooding. Crops grown in such soils are deficient in iodine and hence the disorders due to iodine deficiency exist in such areas.[1]

Goitre is an enlargement of the thyroid gland and is the commonest disorder caused by environmental iodine deficiency. It is estimated that approximately 516 million people in Asia are at risk due to environmental iodine deficiency, with about 176 million actually goitrous. In Nepal, about 14 million people are at risk of which 8 million are goitrous.[1]

The most commonly employed measure for supplementation of iodine to the population at risk to environmental iodine deficiency is iodated salt, as the salt is universally consumed by all, every day and it can be easily iodated. It must be pointed out that supplementation of iodine in salt is a quantitative measure and the minimum quantity which must be available at consumer's level is 150 ug of iodine per person per day. Assuming an average daily intake of 10 gm of salt per person, this is equivalent to 15 parts per million (15 ppm). If the iodine content is less than 15 ppm at consumption, it will not prevent Iodine Deficiency Disorders(IDD) in the population.[1]

## 2. CURRENT STATUS

The entire edible salt in Nepal comes from India under the agreement between HMG Nepal and Government of India. According to the agreement, the Government of India would provide funds:

(i) to meet the cost of iodation of salt to the extent of 100,000 tons per year, the annual requirement of whole of Nepal.

(ii) to meet the construction of warehouse for storage of salt.

(iii) to meet the cost of establishment of 100,000 tons capacity iodation plants in Nepal.

(iv) to subsidize transport cost of salt to 20 inaccessible districts and packing, stamping and labelling of bags.

Since 1973, the entire salt which arrives in Nepal is iodated with an iodine level of 25 ppm. at production. The iodated salt comes from Kharaghoda (Gujarat) or Sambhar Lake (Rajasthan) in jute bag packing of either 100 kg or 75 kg.

The salt is transported from these two places in railway wagons and average of 2 to 6 weeks time is taken for the salt to reach Nepal. The Salt Trading Corporation (STC), Nepal is responsible for receiving the salt and distributing it throughout the country via wholesale traders.

The salt is stored upto maximum of 6 months at STC godowns. The wholesale traders pick up their stock from STC and sell the same to the retailers. The average turnover for wholesale trader is 150 bags per week while that of retailer is 3 bags a week. Most of the wholesale traders have covered storage place. The retailers, however, store the salt either in the same jute bag withmouth open or in open wooden box or sometimes it is sold in open, even on footpath.[2,3,4]

HMG Nepal has plans to instal six iodation plants at five major entry points in Tarai region, with assistance from Government of India. The location of these plants will be at Bhairawa (two plants) and one plant each at Birganj, Biratnagar, Nepalganj Road and Dhangadhi. The total estimated annual production capacity of these plants is expected to meet the annual requirement of whole Nepal, i.e. 100,000 tons of iodated salt.

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## 3. MONITORING OF SALT IODATION PROGRAMME - RELEVANCE.

As mentioned earlier, the objective of an effective salt iodation programme is to ensure a minimum supply of 150 ug of iodine per person per day, i.e. 15 ppm at consumption. Therefore, for the success of IDD control programme, it is extremely essential to establish a network of laboratories which can regularly analyse iodine content of salt. One or two Central Iodine Monitoring Laboratories should be established. These laboratories would function as training centre reference laboratory and provide quality reagents to all the laboratories. Since the estimation of iodine in iodated salt is a simple procedure, a laboratory can be established at each district level.

## 4. IODINE CONTENT OF IODATED SALT - REPORTS AVAILABLE

At present there is no existing facility to monitor iodine content of iodated salt in Nepal. However, since 1976 few reports are available. In 1976, Dr Jean Lequien, UNICEF Consultant collected six samples from railheads, godowns and retail shops from different areas. The results showed that iodine content of iodated salt varied from 10 to 28 ppm of potassium iodate or 5.95 to 16.66 ppm of iodine (Table I)[5]. In the same year Drs. Delange and Velix collected salt samples from Kathmandu market and Rasuwa Valley, the iodine content of which varied between 0.20 and 2.94 ppm. (Table II)[6]. Both the analysis were done at Central Food Research Laboratory, Kathmandu. More recently, the Goitre and Cretinism Eradication Project (GCEP) collected 18 salt samples from Far West and Central districts of Nepal. The analysis was done at Salt Trading Corporation Laboratory, Kathmandu. Only four samples showed iodine content which varied between 1.78 and 7.13 ppm while rest of the fourteen samples did not show any iodine content. (Table III)[7].

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## 5. METHOD FOR IODINE ESTIMATION IN IODATED SALT

There are two methods which are used for estimation of iodine content in salt depending on whether potassium iodide (Kl) or potassium iodate ($KlO_3$) is used for salt iodination:

(i) In case Kl is used for iodination, then to liberate Iodine from salt, bromine water is used. The liberated iodine is then trapped in Kl solution and titrated against sodium thiosulphate.

(ii) If $KlO_3$ is used for iodination then there is no need to use bromine water. By making the salt solution acidic by addition of 2N $H_2 SO_4$, iodine can be liberated which is trapped in Kl solution and titrated with sodium thiosulphate.

Since at both the production centres in India, potassium iodate is used for iodination of salt and the proposed salt iodation plants in Nepal would also use potassium iodate for iodination, the method of choice for estimation of iodine in salt in Nepal, is the second method described above.

The Central Food Research Laboratory was using Bromine method uptil now. Since this method is not necessary for estimation of iodine in iodated salt, the second method was discussed and demonstrated to the personnel in the laboratory. The laboratory has already started using this method for analysis of iodine in iodated salt.

## 6. IODATED SALT SAMPLES COLLECTED DURING PRESENT VISIT -

### RESULTS & DISCUSSIONS.

During the present visit the authors visited different parts of Nepal and Nautamwa rail terminus in India. They gathered information withthe help of a pre-designed proforma "Iodated salt analysis proforma" (Annexure-1) and collected salt samples. The areas from where salt samples were collected were:

6.1 Kathmandu Valley

6.2 Rasuwa District

6.3 Nuwakot District

6.4 Bhairawa (Rupandehi Nautanwa (India) District)

6.5 Hitauda (Makwanpur District)

6.6 Narayanghat (Bharatpur District)

6.7 Pokhara (Kaski District)

6.8 Tansen (PalpaDistrict)

6.9 Gorkha (Gorkha District)

### (a) Kathmandu Valley:

On 18th of May 1985, a total of 13 salt samples were collected from Kathmandu, Bhaktapur and Lalitpur districts of Kathmandu Valley. These samples were collected from wholesale

traders, retailers as well as from consumers. The analysis of salt samples was done at Central Food Research Laboratory using the newly introduced method. The results are presented in Table IV. It is evident that only five salt samples had values more than 15 ppm, the minimum recommended level of iodine at consumer.

Some of the salt samples collected had big crystals mixed with powdered salt. The big crystals and powdered portion of salt from the same sample were analysed separately. The results of this analysis are shown in Table V. It is alarming to note that big crystals of salt (type of salt preferred in highmountain region) retains muchless iodine as compared to powdered portion of the same salt. This brings out an important finding of practical relevance, i.e. the salt used for iodation must be in fine crystalline form for better iodation and effective retention of iodine.

(b) <u>Rasuwa and Nuwakot Districts:</u>

A total of ten and six salt samples were collected from Rasuwa and Nuwakot districts respectively. These two districts are geographically adjacent to each other. The people of Rasuwa district purchase their salt from

wholesalers and retailers who receive iodated salt from Nuwakot district. Iodine content of ten salt samples analysed from Rasuwa district varied between 3.1 ppm and 18.0 ppm while that of six salt samples analysed from adjoining Nuwakot district varied between 5.3 ppm and 35.9 ppm (Table VI).

Since the date of salt iodation the iodine content (PPM) at source and batch number are not marked on jute bags, it is not possible to make any comment on the loss of iodine during transportation and storage. Therefore, it is mandatory to stencil the necessary details, mentioned above, on the jute bags. Unless this information is stencilled on the jute bags, it is not possible to have any information on the iodine retention of iodated salt at different levels of distribution chain. In addition, this information has a direct relevance in deciding on the level of iodine (in ppm) to be modified at iodated salt production centres.

(c) Iodated salt collected from different areas:

A total of 14 iodated salt samples from Nautanwa (India), Bhairawa, Hitauda, Narayanghat, Tansen, Pokhara and Gorkha were collected for analysis of iodine content. The results are given in Table VII.

Nautanwa is one of the important railway stations in India, where over one third of Nepal's iodated salt requirement arrives from Khargoda (Gujarat) andSambhar Lake (Rajasthan), the two salt iodation production centres in India. From Nautanwa, salt is transported in trucks to Bhairawa which has a covered storage facility for 5000 tons. From here it is transported to different parts of Nepal. One salt iodation plant has already been installed at Bhairawa and it is proposed to instal an additional one, by the end of this year.

The results of iodine content of the iodated salt samples analysed vary between 4.2 ppm and 27.5 ppm. There is not only a batch-to-batch variation in iodine content but also variation in the iodine content of salt with big crystals and fine crystals, a finding which was observed in salt samples collected from Kathmandu Valley.

Since no stencil has been used for marking the date of iodation, iodine content in ppm at source and batch number on the jute bags, it is not possible to make any comment on iodine losses at different stages of distribution, transportation and storage chain.

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The information gathered during this visit has focussed on the point that successful salt iodation programme depends on a chain of events. In order to have continued effectiveness of salt iodation programme every link of the chain has to be strong and sound. To begin with, a good quality common salt makes iodation an effective and economic procedure. If the salt arrives in the form of big crystals, it has to be crushed for better iodination. A vigilant laboratory at the salt iodation plants for estimating and regulating the iodine content at source, packing in Low Density Poly-Ethelene (LDPE) lined jute bags or adopting appropriate poly-ethelene family packs, stencilling and labelling the date of salt iodation, the iodine content at source in PPM and batch number are pre-requisites for giving information on iodine retention at different stages of distribution, transportation and storage chain. Instructions on proper storage of iodated salt in STC godowns wholesale and retail outlets and at consumer level have to be circulated and widely publicized. Salt samples need to be collected from salt iodation plants, STC godowns, wholesalers, retailers and consumers at regular intervals and analysed, and a continuous feedback to STC, Salt Iodation Plants, GCEP Project, Central Health Laboratory, Central Food & Research Laboratory , Central Laboratory of Department of Pathology, Institute of Medicine has to be established.

A network of iodine monitoring laboratories at each of the salt iodation plants and district level needs to be established. It is necessary to have Central Iodine Monitoring Laboratories that would provide reagents to the iodine monitoring laboratories need to be organised. In addition, the Central Laboratory should conduct training courses for laboratory personnel. In order to have comparability of results, a standard methodology for estimating iodine content in iodated salt has to be adopted and followed. The consumers, retailers, wholesale traders and the staff of all agencies and departments concerned with IDD should be educated on Iodine Deficiency Disorders and the importance of consuming iodated salt. Thus, every chain of salt iodation programme is important to make it an effective programme that would provide a minimum of 150 ug of iodine per person per day.

## 7. RECOMMENDATIONS:

i) As is evident from the present report the level of iodation of 25 ppm at salt iodation plants in India is not sufficient to ensure, the minimum requirement of 150 ug of iodine per person per day at consumption level. Therefore, to begin with iodation level of 40 ppm iodine be introduced at the salt iodation plants. Based on the iodine retention studies, this level of iodation could be modified.

ii) At present, there is no information available about the iodine retention of iodated salt at different levels of distribution, transportation and storage chain. This is particularly relevant in view of the long duration of storage of salt upto six months at Salt Trading Corporation godowns and at household levels in high mountains. Therefore a systematic study on iodine retention of iodated salt be designed so as to cover all the points in the distribution, transportation and storage chain.

iii) To carry out the iodine retention study it would be mandatory to stencil the date of iodation, the iodine level in PPM at source, and the batch number on the iodated salt packings.

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iv) In view of the recent observation made during this visit that iodine retention of crushed salt is better than that of big crystals, it would be necessary to use crushed salt for iodation.

v) The crushed iodated salt would necessitate the use of better quality packaging material to ensure minimum loss of iodine during transportation and storage. Packaging in LDPE lined jute bags or adoption of appropriate polyethelene family packs would be some of the alternatives.

vi) To ensure availability of a minimum of 150 ug of iodine (15 ppm) at consumption level, a network of Iodine Monitoring Laboratories should be established in Nepal, that would carry analysis of salt samples at regular intervals.

vii) Three central laboratories, and one laboratory each at the five salt iodation plants and one laboratory each at district level should be established.

viii) The Central Food Research Laboratory, the Central Health Laboratory and the Central Laboratory of Department of Pathology, Institute of Medicine can function as the three central laboratories. The first two laboratories can function as service laboratories while the laboratory at the Institute of Medicine can be used for training of laboratory personnel. There should be a close co-ordination between these three laboratories, the Salt Trading Corporation and Goitre & Cretinism Eradication project. Appropriate inputs in terms of manpower, money and materials should be provided to these laboratories.

xi) A uniform and standardised training programme should be formulated for all the laboratory persons working in Iodine Monitoring Laboratories. The responsibility of this should be entrusted to Institute of Medicine. A handbook of monitoring and quality control describing "The use of iodated salt in the prevention of Iodine Deficiency Disorders" and a video tape on "Monitoring and Evaluation of IDD Control Programmes" prepared by UNICEF/ROSCA, New Delhi is available for use in these training programmes.

x) As the procedure for estimation of iodine in iodated salt is simple and relevant to the IDD problem in Nepal, this should be included in the school curriculum at appropriate level. The theory and practical exercise in estimation of iodine in biological fluids should also be included in paramedical and medical courses.

xi) The staff of Salt Trading Corporation, wholesale and retail salt dealers and consumers should be made aware of the problem of IDD in Nepal and the proper methods of storage of iodated salt in order to retain the minimum amount of iodine in the salt.

xii) Since the Goitre and Cretinism Eradication Project and Salt Trading Corporation are working towards the same objective that of eradication of IDD, a common logo should be developed and popularised with the assistance of appropriate health education media.

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Mr Rolf C Carriere, Senior Programme Officer, UNICEF/ROSCA, New Delhi initiated, sponsored and supported the visit to Nepal at various stages. We wish to record our thanks to Mr Carriere.

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## TABLE - I

### POTASSIUM IODATE DETERMINATIONS IN CRUSHED SALT SAMPLES*
(Sampling made by the mission during its assignment in Nepal)

| Sl. No | Place of Collection | No. of Samples Analysed | Pot.Iodate Content (PPM) | Iodine Content (PPM) | Coments |
|---|---|---|---|---|---|
| 1. | Biratnagar Godown | 1 | 12 | 7.14 | Arrived from India 13th-26th Feb 86 |
| 2. | Dharan Shop-1 | 1 | 10 | 5.95 | Salt one month in shop |
| 3. | Dharan Shop-2 | 1 | 18 | 10.71 | Salt one month in shop |
| 4. | Rajbiraj Godown | 1 | 28 | 16.66 | Arrived from India |
| 5. | Janakpur Godown | 1 | 10 | 5.95 | Arrived from India October 1975 |
| 6. | Raxual Railhead | 1 | 10 | 5.95 | Arrived from India 28th Feb 1986. |

- All samples taken between 26 February - 1 March 1976
- Determination carried out by Central Food Research Laboratory, Kathmandu
- Percentage of iodine in Potassium Iodate is 59.5.

* Source: Reference No. 5

TABLE -II

IODINE CONTENT OF SALT SAMPLES ANALYSED AT FOOD RESEARCH LABORATORY, KATHMANDU *

| S. No. | Place of Collection | Place of Origin of salt | No. of Samples analysed | IODINE CONTENT ug/kg | IODINE CONTENT PPM |
|---|---|---|---|---|---|
| 1. | Kathmandu Market | Indian | 30 | 0.45 to 2.94 | 0.45 to 2.94 |
| 2. | Kathmandu Market | Tibetan | 25 | 0.03 to 0.23 | 0.03 to 0.23 |
| 3. | Jumla | Tibetan | 30 | 0.20 to 1.10 | 0.20 to 1.10 |
| 4. | Rasuwa | Indian | 15 | 0.20 to 2.90 | 0.20 to 2.90 |

* Source : Reference No. 6

## TABLE - III

Analysis of salt samples collected by Goitre and Cretinism Survey Team (August/September 1984)

| Sample No. | Iodine Content (ppm) | Details | |
|---|---|---|---|
| 1. | 7.134 | Leplep Ward 3 | TAPLEJUNG DISTRICT |
| 2. | NIL | Leplep Ward 6 | |
| 3. | 4.292 | Papung Ward 2 | |
| 4. | NIL | Papung Ward 7 | |
| 5. | 1.784 | Salyan | |
| 6. | NIL | Namche Bazar | SOLUKHUMBU DISTRICT |
| 7. | NIL | Tapting | |
| 8. | NIL | Khumjung | |
| 9. | NIL | Marabang | RUKUM DISTRICT |
| 10. | NIL | Chumbang | |
| 11. | NIL | Bhalkacha | |
| 12. | NIL | Sakha | |
| 13. | NIL | Masina | ROLPA DISTRICT |
| 14. | NIL | Pachhawante | |
| 15., | NIL | Wastingtharpu | |
| 16 | NIL | Mulpani | BHOJPUR DISTRICT |
| 17. | NIL | Khargacha | |
| 18. | 5.094 | Bechuka | |

## TABLE IV

## ANALYSIS OF IODATED SALT SAMPLES FROM KATHMANDU VALLEY*

| Sample No | Details | Iodine Content (PPM) |
|---|---|---|
| 1. | Consumer sample from Kalmati, Kathmandu | 9.3 |
| 2. | DM Stores, Kalimati | 4.2 |
| 3. | Bhaktapur Wholesale Trader | 24.0 |
| 4. | V. Trader, Wholesale Salt Trader Patan Mangal Bazar, (Salt Bag purchased 6 days back from STC) | 5.3 |
| 5. | Consumer sample from Bhaktapur | 9.5 |
| 6. | Bhaktapur Retailer (Salt Purchased 2 days back). Kept open | 9.5 |
| 7. | Retailer from Kalimati, Kathmandu | 3.2 |
| 8. | Patan: Wholesaler (Purchased one day back) | 21.1 |
| 9. | Retailer (Salt stored in open wooden box) Kalimati. (Bag purchased 2-3 days back) | 6.3 |
| 10. | Retailer on footpath, Patan Mangal Bazar (Bags kept in open) | 5.3 |
| 11. | Retailer from Patan. (Salt purchased two days ago) | 25.0 |
| 12. | Wholesale salt trader, Kalimati | 25.0 |
| 13. | Wholesale salt trader, Kalimati | 29.0 |

All samples were collected on 18 May 1985 and analysed at Central Food Research Laboratory, Kathmandu on 19 May 1985.

## TABLE - V

## IODINE CONTENT (PPM) IN SALT SAMPLES WITH FINE AND BIG CRYSTALS

| Sr No | Sample No | IODINE CONTENT (PPM) | |
|---|---|---|---|
| | | Fine Crystals | Big Crystals |
| 1. | 2 | 4.2 | 2.1 |
| 2. | 3 | 24.0 | 16.0 |
| 3. | 11 | 25.0 | 8.4 |
| 4. | 12 | 25.0 | 16.0 |
| 5. | 13 | 29.0 | 11.6 |

TABLE - VI

ANALYSIS OF IODATED SALT SAMPLES FROM RASUWA AND Nuwakot Districts*

| Sl No. | Place of Collection | District | Date of Collection | Particulars | Iodine Content (PPM) |
|---|---|---|---|---|---|
| 1 | Trishuli | Nuwakot | 7.6.85 | Trishuli Impex, Wholesale Trader, Salt arrived from Kathmandu 10 days back | 10.5 |
| 2. | Trishuli | Nuwakot | 7.6.85 | Shakya Trader, Wholesale Trader. Salt arrived from Kathmandu 7 days back | 10.5 |
| 3. | Trishuli | Nuwakot | 7.6.85 | Narayandas Shreshta, Wholesale Trader, Salt arrived from Kathmandu 15 days back | 5.3 |
| 4 | Trishuli | Nuwakot | 7.6.85 | Nirmala Shreshta, Wholesale Trader, Salt arrived from Kathmandu 6 week back | 6.3 |
| 5 | Trishuli | Nuwakot | 7.6.85 | Wholesale Trader, Salt arrived from Kathmandu 5 week back | 5.3 |
| 6 | Betrawati | Nuwakot | 7.6.85 | Salt purchased from Bhairawa two week back stored in wooden box | 35.9 |
| 7. | Langtang valley | Rasuwa | 28.5.85 | Salt collected from consumer from ward No.1 purchased from Dhunche 2 weeks back in wooden box | 7.4 |
| 8 | Langtang valley | Rasuwa | 28.5.85 | Salt collected from consumer from ward No.4 purchased from Dhunche 6 weeks back stored in wooden box | 3.1 |
| 9 | Daibhung | Rasuwa | 7.6.85 | C.B. Dangol. Retail Salt Trader, Purchased from Betrawati 1 week back, stores in Jute bags. | 7.4 |
| 10 | Daibhung | Rasuwa | 7.6.85 | Kali ka Hotel, salt purchased from Trishuli 8 weeks back, stored in wooden box | 7.4 |
| 11 | Daibhung | Rasuwa | 7.6.85 | Salt collected from consumer purchased from 3 years back, stored in covered wooden box | 18.0 |
| 12 | Daibhung | Rasuwa | 9.6.85 | Salt collected from consumer purchased from "Kali ka Stan" Daibhung 2 back stored in wooden box | 5.5 |
| 13 | Jeevajeeve Daibhung | Rasuwa | 8.6.85 | Salt collected from consumer purchased from Trishuli 4 days back stored in stored in Jute bag | 11.6 |
| 14 | Bhorle | Rasuwa | 11.6.85 | Salt collected from consumer, purchased from Betrawati 2 weeks back, stored in wooden box | 3.1 |
| 15 | Bhorle | Rasuwa | 11.6.85 | Salt collected from consumer, purchased from Trishuli 2 weeks back stored in wooden box | 5.3 |
| 16 | Bhorle | Rasuwa | 11.6.85 | Salt collected from consumer, purchased from Betrawati, 4 weeks back, Stored in case basket | 6.3 |

* All the samples were analysed at Central Food Research Laboratory, Kathmandu on 12.6.1985.

TABLE - VII

ANALYSIS OF IODATED SALT SAMPLES FROM DIFFERENT AREAS

| S.No. | Place of Collection | Date of Collection | Particulars | Salt Details | Iodine Content (PPM) |
|---|---|---|---|---|---|
| 1. | Nautanwa | 31.5.85 | Collected from railway platform. Arrived from Kharghoda on 30.5.85 | Big Crystals | 6.3 |
| 2. | Bhairawa | -do- | Collected from Godown No.5, STC, Bhairawa. Arrived from Kharghoda on 5.5.85 | -do- | 19 |
| 3. | Bhairawa | -do- | Collected from Godown No.5, STC, Bhairawa. Arrived from Kharghoda on 5.5.85 | Fine Crystals | 27.5 |
| 4. | Bhairawa | -do- | Collected from open storage yard, STD Bhairawa. Arrived from Kharghoda on 5.5.85. | -do- | 16.9 |
| 5. | Bhairawa | -do- | Collected from open storage yard, STD Bhairawa. Arrived from Kharghoda on 16.5.85. | Big Crystals | 4.2 |
| 6. | Bhairawa | -do- | Collected from open storage yard, STD Bhairawa. Arrived from Kharghoda on 16.5.85. | Fine Crystals | 15.8 |
| 7. | Hitauda | 30.5.85 | Wholesaler. Salt purchased 4 weeks back. | -do- | 5.3 |
| 8. | Narayanghat | -do- | Retailer. Salt purchased from wholesaler in powdered form. | Powdered | 13.7 |
| 9. | Tansen, Palpa | 31.5.85 | Retailer from Tahsen market. Salt arrived from Bhairawa 2 weeks back. | Fine Crystals | 14.8 |
| 10. | Pokhara | 1.6.85 | Collected from STC Godown Pokhara. Arrived from Bhairawa 3 months back. | Big Crystals | 10.6 |
| 11. | Pokhara | 1.6.85 | Collected from STC Godown Pokhara. Arrived from Bhairawa 3 months back. | Fine Crystals | 20.1 |
| 12. | Pokhara | 1.6.85 | Collected from STC Godown Pokhara. Arrived from Bhairawa 1 month back. | Big Crystals | 3.1 |
| 13. | Pokhara | 1.6.85 | Collected from STC Godown Pokhara. Arrived from Bhairawa 1 month back. | Fine Crystals | 27.5 |
| 14. | Gorkha | 2.6.85 | Wholesaler in Gorkha market. Salt arrived from Pokhara one week back. | -do- | 24.3 |

All the samples were analysed at Central Food Research Laboratory, Kathmandu on 3.6.85.

ANNEXURE - I

## IODATED SALT ANALYSIS PROFORMA

1. Name of Salt Dealer :

2. Address :

   Ward _____ Panchayat _____ Distt _____

3. Wholesaler Retailer

4. Date of purchase of iodated salt:

5. Quantity purchased per week _____, per month _____

6. Cost of 100 kg bag Rs. _____, 75 kg Bag Rs. _____

7. Storage Facility

| | |
|---|---|
| Indoor | Outdoor |
| Covered | Uncovered |
| Jute Bags | Wooden Box |
| Floor: Cement | Muddy |

8. Average duration of storage of salt:
   Less than 1 week, 1 week, 2 weeks, 3 weeks, 4 weeks

9. Selling price of iodated salt to Retailers: Rs. _____
   Consumers: Rs. _____

10. Salt Sample No.

11. Date of Salt Sample Collection

12. Duration of storage of sample at the time of collection

13. Name of the collector:

14. Date of salt analysis:

15. Place of salt analysis:

16. Name of the Analyst:

17. Results: Iodine Content _____ parts per million (PPM)

18. Report sent to:
    (i) Salt Trading Corporation, Date _____
    (ii) Goitre & Cretinism Eradication Project, Date _____
    (iii) Iodated Salt Plant, Date _____
    (iv) Central Food Research Lab. Kathmandu, Date _____
    (v) Central Health Lab. Kathmandu, Date _____

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